

**Remarks**

Receipt is acknowledged of the Office Action mailed November 18, 2004. Claims 1-14 were pending in the application. Claims 1, 5, 7, 13 and 14 have been amended. No new matter has been introduced. Thus claims 1-14 are pending for reconsideration at this time.

Applicants thank the Examiner for acknowledging receipt of the priority documentation in the pending application and for the continuing examination of the pending application.

**In the Specification**

The specification is objected to for various typographical errors. Specifically, the Office Action asserts that page 8, line 4 and page 13, line 15 should recite Fig. 5 instead of Fig. 4. Additionally, the Office Action asserts that  $\text{Al}(\text{CH}_4)_3$  on page 12, line 11 should recite  $\text{Al}(\text{CH}_3)_3$  because a carbon atom may only have four bonds. Finally, the Office Action asserts that  $\text{HF}[\text{N}(\text{CH}_3)_2]_4$  on page 12, line 16 should recite  $\text{Hf}[\text{N}(\text{CH}_3)_2]_4$ .

The specification has been amended accordingly. Withdrawal of the objection to the specification is solicited.

**Claim Objections**

Claim 5 stands objected to because  $\text{Al}(\text{CH}_4)_3$  should recite  $\text{Al}(\text{CH}_3)_3$ . Claim 7 stands objected to because  $\text{HF}[\text{N}(\text{CH}_3)_2]_4$  should recite  $\text{Hf}[\text{N}(\text{CH}_3)_2]_4$ . Claims 5 and 7 have been amended accordingly. Withdrawal of the objection to claims 5 and 7 is solicited.

**Rejections Under 35 U.S.C. §103(a)**

Claims 1, 4 and 8-14 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,580,111 ("Kim '111" hereafter) in view of U.S. Patent No. 6,645,882 ("Halliyal" hereafter). Claim 2 stands rejected under 35 U.S.C. §103(a) over Kim '111 and Halliyal in view of U.S. Patent No. 6,165,841 ("Kim '841" hereafter). Claim 3 stands rejected under 35 U.S.C. §103(a) over Kim '111 and Halliyal in view of U.S. Publication No. 2003/0232501 ("Kher" hereafter). Claims 5 and 6 stand rejected under 35 U.S.C. §103(a) over Kim '111 and Halliyal in view of

U.S. Patent No. 6,720,259 ("Londergan" hereafter). Claim 7 stands rejected under 35 U.S.C. §103(a) over Kim '111 and Halliyal in view of U.S. Patent No. 6,686,212 ("Conley" hereafter). Applicants respectfully traverse these rejections for at least the following reasons.

The Office Action acknowledges that Kim '111 fails to disclose a dielectric film with a stacked structure of Al-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film and Hf-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film on the surface of a storage electrode as claimed. The Office Action asserts, however, that Halliyal discloses a dielectric film with a stacked structure of Al-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film and Hf-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film on the surface of a storage electrode. The Office Action further asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric layer of Kim '111 by the method of Halliyal, because Halliyal's method allows for a relatively high-K dielectric to be formed without forming the lower k dielectric silicon oxide.

Applicants respectfully submit that Kim '111 and Halliyal both fail to disclose or suggest forming the claimed dielectric film on a *polycrystalline* structure as presently recited. Applicants further submit that it would not have been obvious to one of ordinary skill in the art to modify the method of Kim '111 with the method of Halliyal. These submissions are discussed in greater detail below.

### **Polycrystalline Structure**

The Office Action asserts Halliyal discloses forming the dielectric film on a storage electrode. However, Halliyal discloses a MOSFET 100 with an Al-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film and Hf-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film formed **on a p-doped silicon substrate 102** (col. 6, lines 60-64), **not** on a storage electrode as asserted by the Office Action. Moreover, as the Al-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film and Hf-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film of Halliyal are formed on the silicon substrate, they are **formed on a single-crystalline silicon structure** because semiconductor substrates have a single-crystalline structure. Thus, Halliyal discloses forming a dielectric film on a single-crystalline silicon structure.

In contrast, the presently claimed invention recites forming a dielectric film having a stacked structure of Al-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film and Hf-rich  $\text{HfO}_2\text{-Al}_2\text{O}_3$  film on the surface of a **polysilicon** storage electrode, not a single-crystalline structure. As Halliyal fails to disclose or

suggest such a feature, it fails to rectify this acknowledged deficiency in Kim '111.

### **Modification Of Kim '111 By Halliyal**

As noted above, Applicants also submit that it would not have been obvious to one of ordinary skill in the art to modify the method of Kim '111 with the method of Halliyal as asserted by the Office Action. Specifically, the Office Action asserts Kim '111 discloses a method for forming a capacitor similar to that of the present invention. However, Halliyal discloses a dielectric film used for a gate electrode, **not** for a capacitor. As such, there is no step in Halliyal of forming the dielectric film on a storage electrode for use in a capacitor. In fact, as noted above, Halliyal does not form the dielectric film on a storage electrode at all. Rather, Halliyal forms the dielectric film on the semiconductor substrate, **not** on a storage electrode as claimed.

Thus, one of ordinary skill in the art would not look to Halliyal for methods of improving film formation on a storage electrode in a capacitor because Halliyal does not disclose such a step. Further, there is no disclosure in Kim '111 or Halliyal to indicate that such a modification would even be possible. Absent motivation to combine in either reference, the motivation relied on by the Office Action must be based solely on improper hindsight reasoning gleaned only from Applicants' disclosure. Hindsight reasoning is impermissible, as noted in MPEP §2145(X)(A) (*Impermissible Hindsight*).

### **Summary**

In view of the aforementioned remarks, withdrawal of the rejection of claims 1, 4 and 8-14 under 35 U.S.C. §103(a) is solicited. Claims 2, 3 and 5-7 are also believed to be allowable due to their dependence upon claim 1. Withdrawal of the rejection of claims 2, 3 and 5-7 under 35 U.S.C. §103(a) is solicited.

**Conclusion**

In view of the above amendments and remarks, Applicants respectfully request that all objections and rejections be withdrawn and that a notice of allowance be forthcoming. The Examiner is invited to contact the undersigned for any reason related to the advancement of this case.

The Commissioner is authorized to credit any over payment or charge any deficient to deposit account number 08-1641.

Respectfully submitted,

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